

CENTER ROUTING SLIP

FROM			DATE	
Chief, Photogrammetry Division, IEG			6 May 1970	
TO	INITIALS	DATE	REMARKS	
DIRECTOR			<p>MEMO FOR: </p> <p>THROUGH: Chief, IEG/NPIC</p> <p>Attached are PHD comments appraising the usefulness and application of each of the five tasks comprising phase I of the TSSG Basic Research in Precise Mensuration program requested by you at the program briefing on 22 April. PHD has considered these tasks in the light of present knowledge, short-range needs (the next 3-4 years) and application to on-board instruments. We defer to TSSG the appraisal of the long-range usefulness and application of the program.</p>	
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EXEC/DIRECTOR				
SPECIAL ASST				
ASST TO DIR				
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CH/PPBS				
DEP CH/PPBS				
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EO/IEG				
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CH/SSD/TSSG				
PERSONNEL				
LOGISTICS			<p>25X1</p> <p style="text-align: center;">Declass Review by NIMA/DOD</p>	
TRAINING				
RECORDS MGT				
SECURITY				
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Task I. - Mensuration of Color Photography

✓ Upon completion of the Precise Mensuration Study in August 1970 and the acquisition of color photography of the ground truth areas, PHD will investigate the accuracy of measurements from color imagery and compare it with the accuracy attainable from black and white imagery. Included in PHD's study will be an investigation of accuracy using DP's made from the original color negative: (1) a color DP; (2) a B&W DP; and (3) DP's made from single layers of the color ON. If it is found that no significant loss in accuracy is encountered with color imagery then there would be little gained in investigating what could be done to improve the present instruments to measure color imagery. Also the expense of modification would be hard to justify. If it is found that a lesser accuracy results from use of color imagery, then an investigation of optics, light source, etc. would be justified to determine what instrument modifications were necessary to improve measurement accuracy.

In regard to the HPSC, there may be a problem in achieving auto-correlation with color imagery. However, nothing can be done to determine the existence of a problem until the HPSC is operable, which it is not likely to be before January 1971. As time becomes available on the HPSC we will study the effect of color on the auto-correlator system to determine if corrective measures are necessary.

Task II - Reticule Study

PHD has not conducted any investigation of reticle design. The Precise Mensuration Study will not throw any light on this subject. The reticle is part of the human pointing operation which is known to be a significant contributor to measurement error. A change in reticle design might reduce the error due to pointing. A study to determine the effect of reticle design upon accuracy would answer this question. The cost of replacing the present reticle in the monocomparators with one of different design should not be expensive. However, if it was determined that relocation of the reticle in the optical train or equipping the instruments with a variety of reticles, easily switched to accommodate the situation, is required to improve pointing ability, such modification would be costly. A significant improvement would have to occur to justify the cost.

Reticule design and location was investigated in selection of the reticle for the HPSC. Considerable rework has already been necessary in fabricating the reticle for the HPSC to meet the specifications. Therefore it is not likely that any new investigation would produce improvements in the HPSC system that would be economically or technically feasible.

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Task III - Film Stability on the Measuring Instrument

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A literature search and study was conducted in 1967 by both [redacted] in designing the HPSC. It was definitely determined that the high intensity light source, particularly at high magnification, created a serious film stability problem. How successful the means employed in the HPSC controls this problem can only be determined when acceptance tests are conducted. Cursory investigation performed under the Precise Mensuration Study indicates no problem in maintaining film stability with the on-board instruments. Due to the potential of serious problems stemming from film instability, a thorough investigation should be made to determine whether or not a serious problem exists with current instruments, even though we do not believe a problem exists.

No known study has been made on the effect of heat on stability or deterioration of color imagery and dry process material. There is not likely to be a serious problem in this area with present instruments but there may well be a problem with the HPSC. If found to be a serious problem with the HPSC, the cost of modifying the HPSC would be high. Unless color and dry process film accounted for a high percentage of our film input, it would probably be advisable to use our current instruments to measure this type of imagery and limit use of the HPSC to black and white imagery rather than modify the HPSC.

Task IV - Data Readout Control Modules

25X1 The present [] modules are 6-7 years old. They are malfunctioning more frequently with use, requiring more maintenance. Replacement has been budgeted for in FY-71 and FY-72. Greater efficiency through elimination of the need to repeat measurements when a malfunction occurs and of instrument down time while maintenance is performed will result from replacement by new modules.

PHD recommends a limited research effort to investigate what equipment is commercially available to perform this function. The investigation should compare relative merits of each brand, including performance reliability, cost and convenience of controls for operator use.

25X1 [] has been tasked by TSSG to design and fabricate one auxiliary control unit for the [] module. This unit is to be attachable 25X1 to a [] comparator in various locations to determine the most convenient 25X1 location for operator use. The unit will duplicate the [] controls, 25X1 permitting either to be used, at the operator's discretion. Cost of this task is approximately [] The results of the [] study will 25X1 be useful in preparing specifications for [] replacement equipment. If 25X1 we are to replace the [] modules within the next two years as planned, it would not be practical to modify the present modules.

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Task V - Automatic Pointing

The error introduced by human pointing is known to be a major source of measurement error. If a reliable automatic pointing device could be developed this source of error might be greatly reduced. This would permit more accurate measurements and would be particularly valuable when very high accuracy was required. Application would most likely be limited to mono-instruments. The principle of stereo pointing is such that automatic pointing methods are unlikely to be applicable. Automatic pointing instruments developed to date (i.e., the [redacted] comparator) have not performed very successfully. A long development period is likely before an acceptable device is achieved. When achieved, such a device is very likely to be complicated, requiring considerable maintenance.

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A contract is being let to [redacted] to design and build a calibration device for the HPSC. The proposed design includes a self-centering capability which will eliminate the human element in centering the reticle on the marks of a calibrated scale. If this works satisfactorily, then additional research might be undertaken to adapt the principle to achieve self-centering on the edge of an image (line of demarkation between two different densities).

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Task V - Continued

To pursue a study as proposed in the Basic Research plan does not offer much hope of early success. It may, however, be a step in achieving automatic pointing at some distant time. A lengthy research effort is expected before success is achieved in attaining this objective, which is a worthwhile long-range objective. Achievement of this objective may well be similar to that experienced in automatic target recognition, which many efforts by numerous organizations has yet to be achieved.

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